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ABSTRACT

Based on the assumption that learning difficulty in programed instruction is related to completion time and program response error-rates, an attempt was made to demonstrate that deletion of knowledge of results (KR) and first example (E) in the Rule-Example-Positive/Negative Example teaching frame paradigm would increase learning difficulty. Four groups of 31 subsets each completed programs with the following designs: E and KR; E and no KR; KR and no E, and no E and no KR. Program response rates and work rates favored the inclusion of examples. KR influenced completion time when the examples were deleted. It was concluded that examples in teaching frames were a factor influencing learning difficulty. (Author)

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Based on the assumption that learning difficulty in programmed instruction is related to completion time and program response error-rates, an attempt was made to demonstrate that deletion of knowledge of results (KR) and the 1st Example (E) in the Rule-Example-Pos./Neg. Example teaching frame paradigm would increase learning difficulty. Four groups of 31 Ss each completed programs with the following designs: E & KR, E & No KR, KR & No E, and No E & No KR. Program response rates and work rates favored the inclusion of examples. KR influenced completion time when examples were deleted. It was concluded that examples in teaching frames were a factor influencing learning difficulty.

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# Factors Influencing "Learning Difficulty" in Programmed Instruction

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The present study was based on the assumption that learning difficulty is directly related to completion time and response error-rate in programmed materials. Furthermore, certain components in a teaching frame paradigm such as the Rule-Example-Pos./Neg. Example frame could be removed and influence both the time and error-rate, thereby also influencing the program's level of learning difficulty. The first example in the Rule-Example-Pos./Neg., Example paradigm was hypothesized to be a critical component which could influence level of learning difficulty. The question of whether or not knowledge of results would influence learning difficulty was also considered.

## METHOD

Ss were 124 junior and senior educational psychology students at the State University of New York at Plattsburgh.

Four sets of programmed instructional materials were developed, each differentiated on the basis of including or not including examples in the teaching frames and the correct answer as knowledge of results. The basic format of the teaching frames in Programs One and Two consisted of a rule statement followed by an example and a two-example, multiple-choice question. In Programs Three and Four the teaching frames contained only the rule statement and the question. The deletion of the examples from Programs Three and Four resulted in a 31% reduction in the total number of words.

In addition, knowledge of results (KR) was provided in Programs One and Three, but not in Programs Two and Four. Therefore, the four programs were labelled; Program One; Examples-Knowledge of results (EKR), Program Two; Examples-No Knowledge of results (ENKR), Program three; Knowledge of results-No Example (KRNE), and Program Four; No Example-No Knowledge of results (NENKR). The subject matter of of the programs was an hypothetical technique for identifying and labelling parts of a dialog.

The four programs were randomly distributed to the Ss at the beginning of the experimental session. Each S was given an answer sheet on which to record responses to the program and completion time. Time was recorded to the nearest ten seconds. Immediately upon completion of the program, each S was given a 20 item test covering the information. All test questions were multiple-choice with four response alternatives.

## Results and Conclusions

The program response means are shown in Table 1. The difference among the groups was significant ($F=9.71$, $df = 3,120$, $p<.01$). Using paired comparisons, the program response means of Groups EKR and ENKR were each significantly greater than the KRNE and the NENKR Group means ($p<.01$).

The mean test scores for the four groups are shown in Table 1. The differences among the groups were not significant ($F = .280$, $df = 3,120$).

Completion time mean scores for the four groups are shown in Table 1. The differences among the groups were significant ($F = 4.23$, $df = 3,120$; $p < .01$). Paired comparisons revealed that only the completion time means of Groups KRNE and NENKR were significantly different ($p < .01$).

Since Groups EKR and ENKR had approximately 31% more words than Groups KRNE and NENKR, word per minute reading rates were calculated for each group and are shown in Table 1. The differences among the groups were significant ($F=45.44$, $df=3,120$; $p < .01$). The means of Groups EKR and ENKR were each significantly greater than the means of Groups KRNE and NENKR ($p < .01$).

Rate of Comprehension (RC) scores were computed for each S using the following formula: RC = the percent of the test item correct x the reading rate. The RC means for the four Groups are shown in Table 1. The differences among the groups were significant ($F=25.83$, $df=3,120$; $p < .01$). Paired comparisons showed the RC means of the EKR and the ENKR to be significantly greater than the corresponding means of the KRNE and the NENKR Groups ($p < .01$).

It was concluded that fewer errors would result while completing the program if examples were included in the teaching frames. Although there were no apparent differences in completion times or test scores, differences did become evident when work rates in the form of reading rate and rate of comprehension were considered. Therefore, level of learning difficulty, as it relates to program response error-rates and completion time, did increase if the first Example in the Rule-Example-Pos./Neg. Example paradigm was deleted. Feedback or knowledge of results had a positive effect on completion time only when no examples were given.

Table 1

Mean Program, Test, Time, Reading Rate and Rate of Comprehension (RC) Scores For Example-Knowledge of Results (EKR), Example-No Knowledge of Results (ENKR), Knowledge of Results - No Example (KRNE) and No Example - No Knowledge of Results (NENKR) Groups.

| | Groups | | | |
|---|---|---|---|---|
| Variables | EKR | ENKR | KRNE | NENKR |
| Program | 15.06 | 15.50 | 14.43 | 13.96 |
| Time | 41.66 | 39.80 | 43.03 | 38.93 |
| Test | 12.66 | 13.13 | 12.60 | 13.20 |
| Reading Rate | 141.74 | 146.96 | 105.52 | 110.06 |
| RC | 91.88 | 93.69 | 62.66 | 70.91 |